

PATTERNS OF MEGAFLORAL CHANGE ACROSS THE
CRETACEOUS-TERTIARY BOUNDARY IN THE NORTHERN GREAT PLAINS AND
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The spatial and temporal distribution of vegetation in the terminal Cretaceous of Western Interior North America was a complex mosaic resulting from the interaction of factors including a shifting coastline, tectonic activity, a mild, possibly deteriorating climate, dinosaur herbivory, local facies effects, and a hypothesized bolide impact.

In order to achieve sufficient resolution to analyze this vegetational pattern, we have established over 100 megafloral collecting sites, yielding approximately 15,000 specimens, in Upper Cretaceous and lower Paleocene strata in the Williston, Powder River, and Bighorn basins in North Dakota, Montana, and Wyoming. We have integrated these localities into a lithostratigraphic framework that is based on detailed local reference sections and constrained by vertebrate and palynomorph biostratigraphy, magnetostratigraphy, and sedimentary facies analysis. Our goal is a regional biostratigraphy based on well-located and identified plant megafossils that can be used to address patterns of floral evolution, ecology, and extinction.

Our primary areas are near Marmarth, ND; Ekalaka, MT; the Hell Creek area of MT; Glendive, MT; and the Bighorn Basin, MT-WY. In Marmarth, the best controlled area, we established a preliminary biostratigraphy based on 7498 specimens from 62 localities in the 110-m-thick latest Cretaceous Hell Creek Formation and overlying 100-m-thick earliest Paleocene Ludlow Member of the Fort Union Formation. In this sequence, the palynological K/T boundary occurs 2 m above the highest dinosaur remains and is associated with an iridium anomaly and drastic megafloral turnover. However, the boundary occurs above the basal lignite of the Fort Union Formation, is preceded by considerable megafloral turnover in the latest Cretaceous, and is followed by a diverse basal Paleocene megaflora. We have also observed similar late Cretaceous megafloral turnover at Ekalaka and at Hell Creek. In addition, diverse basal Paleocene megafloras occur also in the Hell Creek area and in the Bighorn basin. Furthermore, we see no megafloral evidence for a "fern spike".

These observations do not support the scenario of a impact driven extinction followed by precipitation increase and a depauperate basal Paleocene recovery flora. Instead, we see a rapidly changing late Cretaceous flora that is replaced at the K/T boundary by a stable, widespread Paleocene flora. This pattern implies that the profound and widespread floral changes in the vicinity of the boundary were a result of long-term environmental processes with only a portion being attributable to a bolide impact.